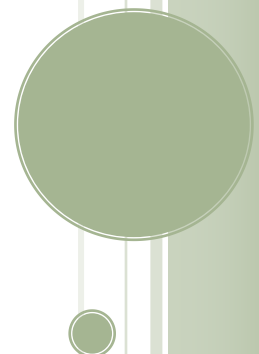


ANTIMICROBIAL- RESISTANT INFECTIONS IN MISSOURI

Report to the Governor and General
Assembly, January 2022

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ABOUT ANTIMICROBIAL-RESISTANT INFECTIONS

The introduction of antibiotics has greatly reduced morbidity and mortality worldwide. However, overuse of these medications has caused bacteria to develop resistance to antibiotics making infections harder and more expensive to treat. Some bacteria have developed pan-resistance, or resistance to all antibiotics. In addition, some antibiotic-resistant bacteria are able to share the genetic material that gives them the ability to resist antibiotics with other bacteria that have not developed the ability on their own. According to the “Antibiotic Resistance Threats in the United States: 2019” report by the Centers for Disease Control and Prevention (CDC), more than 2.8 million antibiotic-resistant infections occur each year in the United States and more than 35,000 people die as a direct result of these infections.¹ Antibiotic resistance is an urgent public health concern.

The reporting period for the Missouri specific data included in this report is from Quarter four of 2020 through Quarter three of 2021 (October 1, 2020 – September 30, 2021).

¹ Centers for Disease Control and Prevention (2019). Antibiotic Resistance Threats in the United States, 2019. Retrieved from <https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf>

HEALTHCARE-ASSOCIATED ANTIMICROBIAL-RESISTANT INFECTIONS

Hospital-acquired or healthcare-associated infections (HAIs) are infections a patient can contract while receiving healthcare in a healthcare facility. These infections may be associated with the use of invasive medical devices, surgical procedures, or gaps in infection control. The CDC estimates that on any given day, about 1 out of 31 hospital patients has at least one HAI.²

The “Missouri Nosocomial Infection Control Act of 2004” mandated that nosocomial methicillin-resistant *Staphylococcus aureus* (MRSA) and nosocomial vancomycin-resistant Enterococci (VRE) be included in the list of reportable diseases and/or conditions. Carbapenem-Resistant Enterobacterales (formerly known as Enterobacteriaceae) (CRE) were added to the list of reportable condition in Missouri in 2018. The final CRE case definition was released in December of 2018.³ Facilities began reporting CRE data in the fourth quarter of 2018.

Cases of MRSA, VRE, and CRE are reported quarterly in aggregate from 285 facilities, which include hospitals and ambulatory surgery centers, throughout Missouri. It is important to note that district cases are assigned based on the healthcare facility address where an individual sought care rather than where they reside; therefore, these numbers do not represent the geographic distribution of these infections across Missouri. This undoubtedly results in greater case counts in districts with more healthcare facilities. All other conditions are reported based on the patient’s home address.

² Centers for Disease Control and Prevention (Updated 2018). Healthcare-Associated Infections-HAI Data. Retrieved from <https://www.cdc.gov/hai/data/index.html>

³ Missouri Department of Health and Senior Services. (2019). CRE Reporting. Retrieved from <https://health.mo.gov/living/healthcondiseases/communicable/communicabledisease/pdf/cre-case-definitions.pdf>

Antimicrobial susceptibility results are not required to be reported for most conditions. It should be noted that the data provided are case counts, not rates of infection. The reported case included in this report should not be considered a representative of all drug-resistant infections in Missouri.

It should also be noted that the SARS-CoV-2 pandemic has impacted data collection and reporting of antimicrobial resistant infections in Missouri. Many facilities have experienced a reduction in the capacity for data collection and reporting given the resources required for the pandemic response. The overall impact of SARS-CoV-2 on the transmission and subsequent surveillance for antimicrobial-resistant infections is not currently known.

METHICILLIN-RESISTANT STAPHYLOCOCCUS AUREUS (MRSA)

Methicillin-resistant *Staphylococcus aureus* (MRSA) is a type of bacteria that is resistant to several antibiotics used to treat *Staphylococcus aureus* (staph) infections. Infections can range from skin infection to pneumonia to bloodstream infections.⁴ The data below include positive results reported in aggregate from all body sites monitored routinely by the reporting facilities. Intermediate sensitivities are reported as resistant in accordance with 19 CSR 20-20.020(13)⁵.

MRSA Cases Meeting the Nosocomial Reporting Requirement in Missouri by District, October 1, 2020 – September 30, 2021

District	Cases
Central	123
Eastern	288
Northwest	292
Southeast	20
Southwest	66
Statewide Total	789

⁴ Centers for Disease Control and Prevention. (2019). Methicillin-resistant *Staphylococcus aureus* (MRSA): General Information. Retrieved from: <https://www.cdc.gov/mrsa/community/index.html>

⁵ Missouri Secretary of State. Code of State Regulations, Title 19 – Department of Health and Senior Services, Division 20 – Division of Community and Public Health, Chapter 20 – Communicable Diseases. Retrieved from: <https://www.sos.mo.gov/cmsimages/adrules/csr/current/19csr/19c20-20.pdf>

VANCOMYCIN-RESISTANT ENTEROCOCCI (VRE)

Vancomycin-resistant Enterococci (VRE) refers to bacteria in the *Enterococcus* genus that have developed resistance to the antibiotic vancomycin.⁶ This antibiotic is indicated for the treatment of life-threatening bacterial infections that have been unresponsive to other antibiotics and is considered an antibiotic of last resort. The data below include positive results reported in aggregate from all body sites monitored routinely by the facility. Intermediate sensitivities are reported as resistant in accordance with 19 CSR 20-20.13.

VRE Cases Meeting the Nosocomial Reporting Requirement in Missouri by District, October 1, 2020 – September 30, 2021

District	Cases
Central	21
Eastern	80
Northwest	83
Southeast	14
Southwest	18
Statewide Total	216

⁶ Centers for Disease Control and Prevention. (2019). Healthcare-Associated Infections: Vancomycin-resistant Enterococci (VRE) In Healthcare Settings. Retrieved from: <https://www.cdc.gov/hai/organisms/vre/vre.html>

CARBAPENEM-RESISTANT *ENTEROBACTERALES* (CRE)

Carbapenem-resistant *Enterobacterales* (CRE) refers to bacteria in the family of *Enterobacterales* (e.g. *Escherichia coli*, *Klebsiella*, etc.) that are resistant to carbapenem antibiotics. This class of antibiotics is reserved for severe infections, such as those that are known or suspected to be resistant to other antibiotics, and are considered to be drugs of last resort. The CDC has ranked CRE as one of the top five most urgent, high-consequence antimicrobial-resistant threats.⁷

Some CRE produce carbapenemase, an enzyme that breaks down carbapenems. These CRE, known as Carbapenemase-producing CRE (CP-CRE), are an emerging public health threat that require heightened surveillance and a timely follow-up investigation because they can spread the genetic material that encodes for the carbapenemase to other bacteria, facilitating the spread of antibiotic resistance. Nosocomial CRE were added as a reportable condition in Missouri in 2018.

CRE Cases Meeting the Nosocomial Reporting Requirement and CP-CRE Cases Reported in Missouri, October 1, 2020 – September 30, 2021

District	CRE	CP-CRE
Central	33	8
Eastern	116	31
Northwest	90	14
Southeast	71	12
Southwest	83	18
Statewide Total	393	83

⁷ Centers for Disease Control and Prevention. (2020). *Antibiotic/Antimicrobial Resistance (AR/AMR) Biggest Threats and Data*. Retrieved from https://www.cdc.gov/drugresistance/biggest-threats.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fdrugresistance%2Fbiggest-threats.html

CARBAPENEM-RESISTANT *ACINETOBACTER*

Acinetobacter is a group of bacteria found in the environment that can live for long periods of time on surfaces or shared medical equipment if they are not properly cleaned. Infections typically occur in patients in healthcare settings, especially those with wounds or indwelling medical devices such as catheters or ventilators. *Acinetobacter* can cause blood, urinary tract, lung, or wound infections. It can also live in patients without causing symptoms, but still be easily spread to others through contact with infected surfaces or person to person, often via contaminated hands.

Acinetobacter that are resistant to carbapenem antibiotics are called carbapenem-resistant *Acinetobacter*. Carbapenem-resistant *Acinetobacter baumannii* (CRAB) are highly antibiotic-resistant bacteria for which few treatment options exist. Carbapenemase-producing CRAB (CP-CRAB) can spread the genetic material that encodes for the carbapenemase to other bacteria, facilitating the spread of antibiotic resistance. The CDC has ranked CRAB among the top five most urgent, high-consequence antimicrobial-resistant threats.⁸

CP-CRAB Cases Reported in Missouri, October 1, 2020 –
September 30, 2021

	CP-CRAB
Statewide Total	39

⁸⁸ Centers for Disease Control and Prevention. (2021). *Antibiotic/Antimicrobial Resistance (AR/AMR) Biggest Threats and Data*. Retrieved from https://www.cdc.gov/drugresistance/biggest-threats.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fdrugresistance%2Fbiggest-threats.html

CARBAPENEM-RESISTANT *PSEUDOMONAS AERUGINOSA* (CRPA)

Pseudomonas aeruginosa is a type of bacteria that is a common cause of healthcare associated infections in the blood, lungs, or other parts of the body after surgery. Multidrug-resistant *Pseudomonas* has been designated as a serious threat by the CDC.⁹ Carbapenem-resistant *Pseudomonas aeruginosa* (CRPA) infections are not currently included in the list of reportable diseases in Missouri.

The Missouri State Public Health Laboratory in collaboration with the CDC initiated a sampling program for CRPA in April of 2019. The objective of the program was to assess the burden of carbapenemase producing CRPA (CP-CRPA) nationally. Participating facilities in Missouri voluntarily submit samples and a random subset of 10 CRPA submitted each month are tested. No CP-CRPA were detected among the samples tested during this reporting period.

⁹ Centers for Disease Control and Prevention. (Updated 2019). *Pseudomonas aeruginosa in Healthcare Settings*. Retrieved from <https://www.cdc.gov/hai/organisms/pseudomonas.html>

DRUG-RESISTANT TUBERCULOSIS

Mycobacterium tuberculosis is a bacterium that causes the disease tuberculosis (TB). TB disease can occur in the lungs or other sites, including the brain, kidneys, or spine and can spread from person to person through the air. Worldwide, TB is the leading cause of death from infectious disease. Drug-resistant TB is relatively uncommon in the United States when compared to developing countries, though rates are increasing.

There are two types of drug-resistant TB of public health concern: multidrug-resistant TB (MDR TB) and extensively drug-resistant TB (XDR TB). MDR TB is resistant to at least two of the most potent first-line TB drugs, Isoniazid and Rifampin. XDR TB is resistant to Isoniazid and Rifampicin, plus any fluoroquinolone, and at least one of the three second-line drugs. Treating drug-resistant TB is very costly and can take years. The average cost of treating a XDR TB case is over \$500,000. Costs are even higher when loss of productivity is considered.¹⁰ No cases of XDR TB have been reported in Missouri.

Multidrug-resistant Tuberculosis Cases Reported in Missouri,
October 1, 2020 – September 30, 2021

	Cases
Statewide Total	1

¹⁰ Centers for Disease Control and Prevention. (2017). Drug-Resistant TB. Retrieved from <https://www.cdc.gov/tb/topic/drtb/default.htm>

NEISSERIA GONORRHOEAE

Gonorrhea is a sexually transmitted disease that can affect both men and women.¹¹ According to the CDC, there are an estimated 1.14 million total cases of gonorrhea each year of which 550,000 cases are resistant to at least one antibiotic.¹² There are few antibiotics left to treat gonorrhea, and resistance to the remaining antibiotics is increasing. The CDC has categorized drug-resistant *Neisseria gonorrhoeae* as an urgent risk to the United States.¹³ No cases of gonorrhea resulting from drug-resistant *Neisseria gonorrhoeae* were reported in Missouri during this reporting period.

NEISSERIA MENINGITIDIS

Neisseria meningitidis is a bacterium that causes meningococcal disease, a severe and often deadly infection. These infections may include meningitis, meningococemia, and sepsis.¹⁴ Due to the severity of this disease, prompt antibiotic treatment is necessary, therefore antibiotic resistance is of concern. The CDC reports that rates of meningococcal disease in the United States are at a historic low.¹⁵ No cases of meningococcal disease resulting from drug-resistant *Neisseria meningitidis* were reported in Missouri during this reporting period.

¹¹ Centers for Disease Control and Prevention. (2014). Gonorrhea: Gonorrhea – CDC Fact Sheet. Retrieved from: <https://www.cdc.gov/std/gonorrhea/stdfact-gonorrhea.htm>

¹² Centers for Disease Control and Prevention. (Updated 2021). Combating the Threat of Antibiotic-Resistant Gonorrhea. Retrieved from: <https://www.cdc.gov/std/gonorrhea/arg/carb.htm>

¹³ Centers for Disease Control and Prevention. (Updated 2021). Antibiotic/Antimicrobial Resistance (AR/AMR). Retrieved from: https://www.cdc.gov/drugresistance/biggest_threats.html

¹⁴ Centers for Disease Control and Prevention. (2020). Meningococcal Disease. Retrieved from <https://www.cdc.gov/meningococcal/index.html>

¹⁵ Centers for Disease Control and Prevention. (2021). Vaccines and Preventable Diseases Meningococcal Vaccination: What Everyone Should Know. Retrieved from <https://www.cdc.gov/vaccines/vpd/mening/public/index.html#how-well-they-work>

STREPTOCOCCUS PNEUMONIAE

Streptococcus pneumoniae is a bacteria that is reportable when an invasive infection occurs in a normally sterile site. The main syndromes include pneumonia, bacteremia, and meningitis and infections can be severe or even fatal¹⁶. The CDC reports 30% of invasive infectious caused by pneumococcal bacteria are resistant to one or more antibiotics.¹⁷

Drug-resistant *Streptococcus pneumoniae* Cases Reported in Missouri, October 1, 2020 – September 30, 2021

District	Cases
Central	1
Eastern	17
Northwest	14
Southeast	5
Southwest	8
Statewide Total	45

¹⁶ Centers for Disease Control and Prevention. (2020). Pneumococcal Disease: Types of Infection. Retrieved from: <https://www.cdc.gov/pneumococcal/about/infection-types.html>

¹⁷ Centers for Disease Control and Prevention. (2020). Pneumococcal Disease: Drug Resistance. Retrieved from: <https://www.cdc.gov/pneumococcal/drug-resistance.html>

SHIGELLA

Shigella is a genus of bacteria that causes a diarrheal illness called shigellosis. *Shigella* is easily spread from person to person. Shigellosis outbreaks frequently occur in daycare centers due to suboptimal hygiene in small and diapered children.¹⁸ Nationally, drug resistant *Shigella* cases have increased significantly since 2013.¹⁹

Drug-resistant Shigellosis Cases Reported in Missouri, October 1, 2020 – September 30, 2021

District	Cases
Central	1
Eastern	9
Northwest	2
Southeast	0
Southwest	0
Statewide Total	12

Questions:

Any questions about this report should be addressed to the Missouri Department of Health and Senior Services, Bureau of Communicable Disease Control and Prevention: 573-751-6113.

¹⁸ Centers for Disease Control and Prevention. (2020). *Shigella* – Shigellosis. Retrieved from: <https://www.cdc.gov/shigella/index.html>

¹⁹ Centers for Disease Control and Prevention. (2019). Drug-Resistant *Shigella*. Retrieved from: <https://www.cdc.gov/drugresistance/pdf/threats-report/shigella-508.pdf>